

Lower Passaic River Study - 2001

US EPA Region 2 Initiative Supplemental Investigatory Study: Passaic River / Diamond Alkali Superfund Site

OVERVIEW

Recognizing the importance and the complexity of the Passaic-Hackensack–Newark Bay system, US EPA has committed to:

- integrate and evaluate existing data in the Passaic River watershed;
- determine the appropriate geographical scope to address recognized problem areas;
- insure effective interfaces are established with ongoing NJDEP, USACE and Harbor Estuary Program - Contamination Assessment and Reduction project so that the value of data collection efforts is maximized; and
- identify other potentially responsible parties,

Since 1994, when Occidental Chemical Company (OCC) entered into an Administrative Order on Consent with the US EPA; Chemical Land Holdings (CLH), on behalf of OCC, has designed and executed a Remedial Investigation (RI) / Feasibility Study (FS) work plan, which address the contaminated sediments of the Passaic River in the vicinity of the OCC facility. These sediments are contaminated with a variety of chemicals (including dioxin, PCBs, pesticides, TEPH, PAHs, and metals) and NJDEP has instituted a 'do not eat' advisory/prohibition for both fish and shellfish. The RI/FS primarily focused on the six-mile stretch of river which extends upstream from the abandoned ConRail Railroad bridge¹ and is named the Passaic River Study Area (PRSA).

The contaminants in the sediments underlying the Passaic River are of concern to various federal and state regulatory agencies because they can have:

- ecological health effects;
- human health effects; and
- economic impacts on navigational dredging disposal costs.

As water quality, sediment quality and biological data from the RI/FS have become available, the scientific understanding of the Passaic River system has evolved and the potential importance of the inter-relationship of the upstream Passaic River (upstream of the PRSA); and Hackensack River - Newark Bay system with the tidal PRSA has become apparent. Also during this period the U.S. Congress directed EPA to have the National Academy of Science / National Research Council (NRC) review, select and refine a scientific, risk-based framework for assessing the remediation alternatives for exposure of humans and other living organisms

¹ Which is about 0.8 miles above the Passaic River's confluence with Newark Bay.

to PCBs² in contaminated sediments. Furthermore, NJDEP has initiated a watershed based total maximum daily load (TMDL) effort for the Passaic River and during the summer of 2001 the U.S. Army Corps of Engineers (US ACE) completed a reconnaissance survey of the lower Passaic River, as part of their Hudson-Raritan Estuary Restoration Initiative, and is currently developing a Lower Passaic River Ecosystem Restoration Project Management Plan (PMP) in consultation with US EPA.

The US EPA, recognizing the importance of looking at the Passaic River as an integral component of the Passaic - Hackensack - Newark Bay system, has committed to better understand this system. The potential benefits of addressing the environmental concerns facing the Passaic River via a unified watershed approach is that the primary contaminants of concern can be addressed more cost and time effectively. Additionally, this effort will supplement the existing PRSA RI/FS data base with the data being collected and compiled via the New York - New Jersey Harbor Estuary Programs (HEP) Contaminant Assessment Reduction Project (CARP) system-wide water quality study and other programs, such as NJDEP's UST, RCRA and ISRA contaminated site databases. Also as the US ACE's Lower Passaic River Ecosystem Restoration PMP effort proceeds, US EPA will continue to coordinate with the US ACE and make sure that any additional data that are assembled and/or collected will also be used to supplement the PRSA RI/FS data base and be made available to the US ACE.

The five primary objectives of this effort will be to:

1. Evaluate the watershed as an integrated system, which includes the upstream tidal Passaic River, the Hackensack River and Newark Bay;
2. Identify, collect and assemble available system-wide environmental data;
3. Establish a unified Passaic/Hackensack/Newark Bay data base;
4. Identify additional potentially responsible parties (PRP) and sources of pollution; and
5. Identify and apply the appropriate scientifically-based modeling framework that will comply with the recommendations of the National Research Council's "A Risk-Management Strategy for PCB-Contaminated Sediments" and which specifically incorporates hydrodynamic transport, sediment transport, contaminant fate & transport and bioaccumulation sub-models.

The project is scheduled to start in the Fall of 2001.

2 The NRC report was completed in mid 2001 and though it focuses primarily on assessment of PCB contaminated sediments, much of the information in the report has been judged to be applicable to other sediment contaminants, especially the hydrophobic chemicals found in the Passaic River sediments (e.g. dioxin, pesticides, among others).

**SCOPE OF WORK
DIAMOND ALKALI
26 Jun 01**

- A. Conduct the technical assistance RI/FS activities for the Diamond Alkali Superfund Site, Operable Unit Two, Passaic River Study Area.
- B. Conducts the technical assistance for RI/FS activities in accordance with EPA/540/G-04 and any future editions, Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA, Interim Final.

TASK 1. Preparation of Work Plan and Schedule

Setting-up and attending an in-depth meeting with the EPA RPMs, GIS staff, and possibly with the EPA R5-FIELDS team and the AE firm project management team personnel to discuss this project prior to preparation of the Work Plan. Such a meeting shall be scheduled within one to two weeks of USACE's receipt of this IAG. It is expected that the Work Plan will be prepared in Draft Final form within two weeks of an in-depth scoping meeting.

TASK 2. Inventory historical data related to the Passaic River / Newark Bay System

Sediment, biota, and water quality data, as well as physical data (grain size, bathymetry, flow rates) exists on the Passaic River from a multitude of programs, agencies, and private sources. Some of the historical data is not in digital form. Some data is in accessible electronic databases (e.g. PCS, RCRIS, STORET, GIS, etc.), while others can be obtained from the ongoing regulatory programs (e.g. RCRA, NPDES, REMAP, CERCLA etc.) Still, other data can be found in the published literature. Table 2 provides a listing of some potential data sources, while Table 3 provides a bibliography of citations identified to date.

Preparation of a overview report identifying all identified sources of data on the Passaic River, Newark Bay and Hackensack River system will be prepared within 2 months of project initiation. This report will evolve into a 'living' document that will reside on the projects internet site.

TASK 3. Evaluate HEP/CARP Database and Established a Unified Passaic River Database or Subset-Database

The Harbor Estuary Program's (HEP): Contaminant Assessment and Reduction Project (CARP) is establishing a system-wide database, which should be compatible with this project goals of compiling the data into one integrated, geospatial defined database. The HEP/CARP database should be evaluated and integrating such data into our study would greatly enhance our understanding of the Passaic River contamination problem. A decision will be made whether to sub-contract with the HEP database consultant or to establish a parallel or independent database strategy.

TASK 4. Populate and QA/QC Passaic River Database

Once the data sources are identified, the data must be extracted and classified. Classification schemes will be established as part of the data management system. Therefore, all relevant, available historic and current data on the Passaic River / Hudson-Raritan estuary will be inputted into the database (i.e. sediment, biota, and water quality data, effluent, sludge, as well as physical data [grain size, bathymetry, flow rates] etc.) from the identified programs, agencies, and private sources (e.g. Table 2). Some of the historical data might not be in digital form. An appropriate scheme will be implemented that addresses the need to established data quality flags (e.g., collected by a government program with stringent QA/QC equivalent to CERCLA standards; collected by a graduate student; collected for RCRA; etc.). The database will be compatible with EPA's GIS platform. A 'living' summary report of database (list of references, links to meta files, etc.) will reside on the WWW page established in Task 9.

Task 5. Identify Additional Potentially Responsible Parties (PRPs), Synthesis Data of Notified PRPs, and Source Trackdown

Fourteen PRPs have been identified while scores of others have been requested to supply information concerning their sites and operational history. Extensive files have been established at 290 Broadway, NY, NY and supplemental analysis of available information has been conducted by Chemical Land Holding's consultants. In addition, other potential PRPs might be identified via the mass balance modeling and associated source trackdown efforts that will be conducted as part of this study.

Analysis and synthesis of loading information regarding all identified and probable PRPs will be conducted, reported via this task and incorporated into the database and GIS system.

Task 6. Develop Detailed Conceptual Model & Design Decision Support Framework

The consultant* contracted by the Hudson River Foundation as part of the ongoing USEPA led Harbor Estuary Program will be used to develop detailed conceptual model of the site which will be used to establish the deterministically based decision support framework which will be used in the engineering evaluation of the data collected for the Passaic / Hackensack River – Newark Bay system. The methodology that will be used for this project will be compatible with: "A Risk-Management Strategy for PCB-Contaminated Sediments" that the

U.S. Congress directed EPA to have the National Academy of Science / National Research Council (NRC) produce.

Task 7. Preliminary Contaminant Mass Balance and In-situ Mass Quantification

The consultant* contracted by the Hudson River Foundation as part of the ongoing USEPA led Harbor Estuary Program will be used to develop a preliminary contaminant mass balance for each contaminants of concern (COC - e.g. cadmium, copper, lead, mercury, nickel, zinc, PAH, DDT, PCBs and dioxin). Also they will spatially estimate the in-situ mass for each COC and provide visualizations of the existing contaminant spatial and temporal distributions.

Task 8. Evaluate HEP/CARP Tier 2 Modeling Framework

The consultant* contracted by the Hudson River Foundation as part of the ongoing USEPA led Harbor Estuary Program will evaluate the appropriateness of the HEP/CARP Tier 2 Modeling framework with respect to the risk management framework guidance provide by the NRC contaminated sediment management strategy and EPA guidance and policy statements.

Task 9. Development & Implementation of Project Community Interface Strategy (WWW) with a compatible Geographic Information System

USEPA currently has a WWW information page for the Passaic River project that needs to be expanded to include not only project information but also access to base line data, project documents, etc. A project – community interface strategy will be develop along the lines of what has been developed for USEPA's Hudson River Superfund Project. Additionally, compatibility with USEPA's GIS system will be assured, so that appropriate project maps, databases, etc. developed for this project will be able to be seen via the WWW.

Task 10. Establish Technical Expert Team

Nationally recognized experts in the specialty areas identified as important for this project's success should be identified and contracted to be available to support the project:

- Sediment Transport (e.g. Wilbur Lick, UCSB)
- Food Chain (e.g. Gobus or J.P. Connolly)
- Chemical Fingerprinting
- Etc.

Task 11. Project Management

The lead consultant will separately break out the resources required to successfully manage this project.

Task 12. Meetings

The lead consultant will provide estimates of the amount of resources required to assemble and attend the meetings required for the success of this project.

For this project USEPA's preference is for a small, integrated team of experienced professionals led by a strong technical Project Manager (most likely an engineer) whose skill

set includes:

- source identification (i-wwtp; potw-ipp/sqar; csos; prp identification)
- water quality, sediment quality and biological data: collection /analysis / synthesis
- contaminated sediment projects
- experience interacting with 'contaminant fate & transport & food chain' modelers
- information management - database
- community interactions
- preliminary engineering alternative analysis
- risk analysis
- major project experience (lead pm on large studies >\$5,000,000 studies)

The interview should be attended by key team members who can speak directly to their and the firms experience regarding:

1. Contaminated Sediment Remediation Projects
2. PRP Identification and Quantification of Mass Loadings
3. Riverine, estuarine or coastal database assembly, development and QA/QC.
4. Website for public access to project records, information, etc.
5. Interacting with specialty sub-consultants: Modeling, fingerprinting, etc.

The participating firms are expected to bring:

- work products from similar projects,

which they can use to demonstrate their familiarity with the technical tasks.

Prior to the interview, the consultant should provide copies of their:

- targeted (project relevant) company qualifications,

which includes a:

- one to two page summary of a project(s)

which are similar to in size and complexity to a Hudson River, New Bedford Harbor, Fox River, Lower Passaic River, etc. contaminated sediment remediation project.

The time-frame for completion of this project is 12 months.

Program Manager

Thomas M. Simmons
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* At the December 12, 2001 Harbor Estuary Program TMDL Work Group meeting the Hudson River Foundation announced that they had signed a contract that day with HydroQual, Inc., Mahwah, NJ as the HEP/CARP modeling consultant.

Table 1
PASSAIC RIVER ENFORCEMENT LIST

I. Noticed Parties	
1. Occidental Chemical Corporation (<i>Party Performing the RI/FS</i>) The Administrative Order on Consent was negotiated by and all the work done to date has been performed by Chemical Land Holdings (CLH), on behalf of Occidental Chemical Corporation, as successor to Diamond Alkali.	
2. Alcan Aluminum Corporation*	9. Monsanto Company
3. Ashland Chemical Company*	10. Otis Elevator Company*
4. Bayer Corporation	11. Public Service Electric & Gas Company*
5. Benjamin Moore & Co.*	12. Reilly Industries, Inc.*
6. Chris-Craft Industries, Inc.*	13. Sherwin-Williams Company*
7. Eastman Kodak Company	14. 360 North Pastoria Environmental Corp.
8. E.I. du Pont de Nemours and Co.	* Companies that have joined the Passaic River Watch Group
II. Companies in Receipt of 104e Request for Information	
1. A & L Dyers	41. Hummel Croton
2. A.Gross & Co.	42. Hy-Grade Electroplating
3. Active Oil	43. Joseph Super & Sons
4. Adco Chemical	44. Kearny Smelting & Refining
5. Alden Leeds	45. Kleer Kast **
6. Alliance Chemical**	46. MacArthur Petroleum
7. Associated Autobody	47. Manco Metal Finishers
8. Atlas Refinery	48. Meile Brothers Trucking
9. AT&T**	49. Moyer Plating
10. Automatic Electroplating	50. Newark Morning Ledger
11. Avon Drum	51. Newark Police Firing Range
12. B-Line Trucking	52. Newark Housing
13. Barth Smelting & Refining	53. Pabst Brewing Co.
14. BASF**	54. Paramount Plating
15. Berg Chemical	55. Passaic Valley Sewerage Commission
16. Brightboy Abrasives	56. Pfister
17. Hoechst Celanese Chemical**	57. Pittsburgh Plate Glass (PPG) **
18. Charles F. Guyon	58. Prest-O-Lite
19. Chemical Compounds**	59. RCA
20. Congoleum**	60. Reichold Chemical
21. Consolidated Laundries	61. Revere Smelting**
22. Conus Chemical	62. RFE Industries
23. Crucible Steel**	63. Rose Ribbon & Carbon Manufacturing
24. C.S. Osborne	64. RW Greef
25. CWC Industries	65. Sergeant Chemical
26. Driver Harris	66. Sonneborn & Sons
27. DS Plumb	67. Spencer Kellogg**
28. Eagle Affiliates	68. Stauffer Chemical
29. Elan Chemical**	69. Sun Chemical
30. Engelhard Industries	70. Synfax Manufacturing
31. Essex Chemical	71. Timco
32. Fairmount Chemical**	72. Tower Manufacturing
33. Fleet Auto Electric	73. Union Carbide**
34. Flexon Industries	74. Universal International Industries
35. Franklin Burlington Plastics**	75. US Industrial Chemical
36. Frederick Gumm Chemical**	76. Vulcan Material
37. H. Goodman & Sons**	77. Walter Kidde
38. Grignard Chemical	78. Westinghouse Electric
39. Helion Industries	79. Witco Humko Chemical
40. Honig Chemical	80. Worthington Dresser
** may be direct dischargers (17 of 80).	

Table 2
Potential Data Sources

Local/State/Inter-State/Federal Agencies:

- | | |
|---------------------------------------|--------------------------------------|
| • Garden State Parkway Authority | • Hudson River Foundation |
| • Interstate Environmental Commission | • NJDEP |
| • NJDOH | • NJDOT |
| • NJMR | • NOAA |
| • NYSDEC | • Passaic Valley Sewerage Commission |
| • Passaic Valley Water Commission | • Port Authority of NY and NJ |
| • UFWS | • USACE –New York District |
| • USEPA | • USGS |

Colleges/Universities:

- | | |
|--------------------------------------|--------------------------------------|
| • Rutgers University | • Stevens Institute |
| • University of Maryland | • Woods Hole Oceanographic Institute |
| • Columbia/Lamont | • New Jersey Institute of Technology |
| • New Jersey Marine Sciences Consrt. | • RPI |
| • Farleigh-Dickinson University | • SUNY-Stony Brook |
| • Manhattan College | • Montclair State University |

Consultants

- | | |
|-------------------------|------------------------------------|
| • LMS Engineers | • Great Lakes Environmental Center |
| • HydroQual, Inc. | • Moffet & Nicols |
| • Najarian & Associates | • Malcolm Pirnie, etc. |

Towns and Cities:

- | | |
|--------------|-------------------|
| • Belleville | • Clifton |
| • Garfield | • Kearny |
| • Newark | • North Arlington |
| • Passaic | • Rutherford |
| • Wallington | |

Table 3
Bibliography of citations identified to date.

Author(s)	YR	Title	Journal / Publisher Citation
Adriaens, Peter , Ph.D	1999	"Anaerobic Transformation of Polychlorinated Dibenzo-p-Dioxins and Dibenzofurans as a Bioremediation Strategy for Passaic River Sediments"	Environmental and Water Resources Engineering, Department of Civil and Environmental Engineering, Univ Michigan
Albrecht, I.D. , A.L. Barkovskii, P. Adriaens.		"Production and Dechlorination of 2,3,7,8-Tetrachlorodibenzo-p-dioxin in Historically-Contaminated Estuarine Sediments."	Environmental and Water Resources Engineering, University of Michigan.
Albrecht, Iris D. et.al		"Stimulation of PCDD Dechlorination in Historically Contaminated Sediments"	Department of Civil and Environmental Engineering, University of Michigan.
Anderson, P. W.	1974	"Water Quality and Streamflow Characteristics, Raritan River Basin, New Jersey",	New Jersey Department of Environmental Protection, Geological Survey.
Arthur, M. F. and J. I. Frea	1989	"2,3,7,8-Tetrachlorodibenzo-p-Dioxin: Aspects of Its Important Properties and Its Potential Biodegradation in Soils."	Journal of Environmental Quality 18(1): 1-11.
Astle, J. W., F. A. P. C. Gobas, et al.	1987	"Lake Sediment as Historic Records Of Atmospheric Contamination by Organic Chemicals."	Sources and Fates of Aquatic Pollutants. Washington D.C., American Chemical Society: 57-77.
Author Unknown	1989	" 2 E. P. A. Studies Confirm Threat To Fish of Dioxin From Paper Plants".	The New York Times: C4.
Author Unknown	1995	"TCDD Dose/Response in Animals and Humans."	EPA (a).
Author Unknown	1995	"Comments on the U.S. EPA's 1994 Health Assessment for 2,3,7,8-TCDD and Related Compounds.".	EPA (a)
Balloffet, A., M. L. Scheffler, et al.	1982	"Frequency of Tidal Storm Surge at New York Harbor(New York) and Newark Bay (New Jersey)".	Coastal Engineering. 6: 281-298.
Barabas, Noemi , Pierre Goovaerts and Peter Adriaens	???	"Geostatistical Interpretation Of Dioxin Reactivity In Sediments"	Department of Civil and Environmental Engineering, Univ of Michigan.
Barber, T. R., D. J. Chappie, et al.	1988	"Using A Spiked Sediment Bioassay To Establish A No-Effect Concentration For Dioxin Exposure To The Amphipod <i>Ampelisca Abdita</i> ."	Environmental Toxicology and Chemistry 17(3): 420-424.

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Author(s)	YR	Title	Journal / Publisher Citation
Basu, D. K., D. Mukerjee, et al.	1985	" Health Assessment Document for Polychlorinated Dibenzo-p-Dioxins."	U. S. Environmental Protection Agency.
Bonnevie, N. L., D. G. Gunster, et al.	1992	"Lead Contamination In Surficial Sediments From Newark Bay, New Jersey."	Environmental International 18: 497-508.
Bonnevie, N. L., R. J. Wenning, et al.	1993	"Distribution of Inorganic Compounds in Sediments from Three Waterways in Northern New Jersey."	Bulletin of Environmental Contamination and Toxicology 51: 672-680.
Bonnevie, N. L., S. L. Huntley, et al.	1994	"Trace metal contamination in surficial sediments from Newark Bay, New Jersey."	The Science of the Total Environment 144: 1-16.
Bopp, R	1988	" Dioxins in the Newark Bay ",	Lamont- Doherty Geological Observatory of Columbia University: 8-11.
Bopp, Richard F., S. Chillrud, E.Shuster, H. James, F. Estabrooks	1998	"Trends in Chlorinated Hydrocarbon Levels in Hudson River Basin Sediments."	Environmental Health Perspective, Vol 106
Bothner, M.H. , P.W. Gill, W.S. Boothman, B.B. Taylor and H. A. Karl	1998	"Chemical Gradients in Sediments Cores from EPA Reference Site off the Farallon Islands-Assessing Chemical Indicators of Dredged Material Disposal in the Deep Sea"	Marine Pollution Bulletin, Vol 36
Breteler, R. J	1984	"Chemical Pollution of the Hudson-River Estuary." National Oceanic and Atmospheric Administration.	National Oceanic and Atmospheric Administration
Bureau of National Affairs, I	1989	"Preamble to OSHA Final Rule Revising Workplace Air Contaminant Limits."	Chemical Regulation Reporter 12.
Burkhard, L. P. and D. W. Kuehl	1986	"N-Octanol/Water Partition Coefficients by Reverse Phase Liquid Chromatography/Mass Spectrometry for Eight Tetrachlorinated Planar Molecules."	Duluth, Minnesota
Chakrabarty, A. M.	1987	"Microbial Degradation of 2,4,5-T and Chlorinated Dioxins."	Chicago, Illinois, Illinois University at the Medical Center.
Choudhry, G. G. and G. R. B. Webster	1986	"Photochemical Quantum Yields and Sunlight Half-Lives of Polychlorodibenzo-p-Dioxins."	Chemosphere 15(9-12): 1935-1940.
Choudhry, G. G. and G. R. B. Webster	1989	"Environmental Photochemistry of PCDDs. 2. Quantum Yields of the Direct Phototransformation of 1,2,3,7-Tetra- , 1,3,6,8- Tetra-, 1,2,3,4,6,7,8- Hepta- , and 1,2,3,4,6,7,8,9- Octachlorodibenzo-p-Dioxin in Aqueous Acetronitrile and Their Sunlight Half-Lives."	Journal of Agricultural Chemistry 37: 254-261.

Author(s)	YR	Title	Journal / Publisher Citation
Clarke, A. N., D. J. Wilson, et al.	1996	Clarke, A. N., D. J. Wilson, et al. (1996). "A Review of 2,3,7,8-Tetra Chlorinated Dibenzodioxins and Toxicity Equivalencies in Fish in the United States and International Waterways."	Hazardous Waste & Hazardous Materials 13(4): 419-443.
Clarke, A. N., M. M. Megehee, D. L. Lowe, et al	1994	"A Review of Polychlorinated Dibenzofurans and Polychlorinated Dibenzodioxins in Sediments in the United States and International Waterways."	Hazardous Waste & Hazardous Materials 11(2): 253-275.
Cook, P. M., A. R. Batterman, et al.	1989	"Chapter 6- Laboratory Study of TCDD Bioaccumulation by Lake Trout from Lake Ontario Sediments, Food Chain and Water."	
Cooper, K. R. and A. Cristini	Undated	Cooper, K. R. and A. Cristini (Undated). "The Bioavailability and Physiological Effects of Dioxins on Bivalve Mollusks, Crustacea and Fin Fish."	
Corbet, R. L. and G. R. B. Webster	1988	"Fate of 1,3,6,8- Tetrachlorodibenzo-p-Dioxin In An Outdoor Aquatic System."	Environmental Toxicology and Chemistry 7: 167-180.
Crawford, D. W., N. L. Bonnevie, et al.	1994	"Historical Changes in the Ecological Health of the Newark Bay Estuary, New Jersey."	Ecotoxicology and Environmental Safety 29: 276-303.
Crawford, D. W., N. L. Bonnevie, et al.	1995	"Sources of Pollution and Sediment Contamination in Newark Bay, New Jersey."	Ecotoxicology and Environmental Safety 30: 85-100.
Crosby, D. G. and A. S. Wong	1971	"Photodecomposition of Chlorinated Dibenzo-p-Dioxins."	Science 173(748-749).
Crosby, D. G. and A. S. Wong	1977	"Environmental Degradation of 2,3,7,8- Tetrachlorodibenzo-p-Dioxin (TCDD)."	Science 195(1337-1338).
De Vault, D., W. Dunn, et al.	1989	"Polychlorinated Dibenzofurans and Polychlorinated Dibenzo-p-Dioxins in Great Lakes Fish: A Baseline and Interlake Comparison."	Environmental Toxicology and Chemistry 8(1013-1022).
Dinkins	1998	"New Solutions for Old Problems in the Newark Bay."	Seton Hall Law Review 1198(29): 1.
Dobbs, A. J. and C. Grant	1979	"Photolysis of Highly-Chlorinated Dibenzo-p-Dioxins by Sunlight."	Nature 278: 163-165.
Dulin, D., H. Drossman, et al.	1986	"Products and Quantum Yields for Photolysis of Chloroaromatics in Water."	Environmental Science and Technology 20(72-77).
Eduljee, G.	1987	"Volatility of TCDD and PCB From Soil."	Chemosphere 16(4): 907-920.
Eduljee, G. H. and D. I. Townsend	1987	"Evaluation of Potential Mechanisms Governing Dioxin Congener Profiles in Soils Near Combustion Sources."	Chemosphere 16(5): 1095-1104.

SCALE OF 10

TAMS

MIKE SPERA

5

PM

ERIC

1
MP

8

BOB KEHEL

URS

8

Buffalo

2
CAM

8

FRANK

3
ETE

10

STEPHEN

Buffalo

13
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EXPERIENCE

5

5

8

8

10

PM has major tidal experience

OVERALL UNDERSTANDING

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9

9

7

10

DATABASE

OVERALL TEAM

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6

7

7

9

POSITIVE ↑

BS ↓ NEGATIVE

Level 1

7 = -7

7 = -7

9 = -9

9 = -9

1 (= +10)

community
can't like
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